

ingly, southwest warnings were issued for Lake Superior and northern Lake Michigan, and on the following morning the warnings were extended to include the remainder of the Great Lakes. The center of the storm passed eastward just to the north of the Lakes on the 20th, with gradually decreasing energy. Within the period covered by the warnings strong winds occurred rather generally, with verifying velocities at about one-half the stations.

The next disturbance to call for warnings was central on the morning of the 23d, over Ohio. At that time but little energy was evident, but the pressure in and near the center of the storm was decreasing rapidly. Small-craft warnings were advised for Lakes Erie and Ontario. Noon special observations, however, indicated a marked increase in intensity, Erie, Pa., reporting a wind velocity of 48 miles an hour from the southeast, and a 2-hour pressure fall of 0.14 of an inch. Therefore, southeast storm warnings were substituted for the small-craft warnings on Lake Ontario and on Lake Erie from Erie, Pa., eastward. The warnings were lowered a few hours later, however, the night reports indicating that the disturbance was losing energy. No verifying velocities other than that referred to in the foregoing were reported.

On the morning of the 25th a disturbance from the Northwest was central in northern Minnesota with increasing strength. Small-craft warnings were then issued for Lake Superior and northern Lake Michigan, but at 2 p. m. northwest storm warnings were substituted. At night the warnings were extended over the remainder of the Lakes, southwest warnings being displayed on the Lower Lakes. The storm continued its eastward movement, but it lost energy after the morning of the 26th. Generally speaking, the warnings were verified on the Upper Lakes, but on the Lower Lakes only fresh to strong winds occurred.

Another disturbance from the Northwest was central over northern Manitoba on the morning of the 28th and it appeared to call for southwest warnings on Lake Superior and the northern portions of Lakes Michigan and Huron. Accordingly, these were issued. The warning was verified in part, moderate gales being reported from central Lake Superior.

The final storm warning for the month was issued on the 29th for a disturbance that had moved up the Mississippi Valley from the Gulf of Mexico to a position central on the morning of that date near Memphis, Tenn., and with a marked increase in intensity. At 2 p. m. northeast warnings were issued for Lake Michigan, and southeast warnings for Lake Huron. At night the warnings were extended over the Lower Lakes, southeast warnings being displayed. This storm moved north-northeastward from Memphis. As it reached the Lake Region the disturbance decreased in intensity, but it caused gales over portions of Lake Erie on the night of the 29th-30th.

Cold-wave warnings.—Coldwave warnings were issued as follows: On the 20th, for North Dakota, northern Minnesota, northern and eastern upper Michigan, and extreme northern lower Michigan; on the 25th, for North Dakota and northwestern Minnesota; and on the 30th, for Montana, Wyoming, the Dakotas, and northern Minnesota. For the most part these warnings were verified but, as indicated in the first part of this report, the cold was not severe.

Frost warnings.—Frost warnings were issued on a number of dates until the 21st for southeastern Kansas. The frosts that occurred were apparently of little economic importance.

Stock warnings.—Warnings for stock interests were issued on the last day of the month for the Dakotas, western Nebraska, Montana, and Wyoming in connection with the expected occurrence of snow and much colder weather in those States. In general, ensuing conditions were as predicted; however, little or no snow fell in South Dakota and western Nebraska.

Forecasts for the benefit of beekeepers in this district were begun on a small scale. The necessary arrangements were not completed until near the middle of the month and only one special forecast was issued. It is understood that plans are under way to extend this forecast service to the entire country where it is not already in operation. The work is being carried out by the American Honey Producers' League with headquarters at Madison, Wis. The particular information desired by those in the Chicago district is a forecast in November of a day or two with a temperature of 50° or higher and clear weather, followed by cloudy and colder.—C. A. Donnel.

NEW ORLEANS FORECAST DISTRICT.

Moderate weather conditions prevailed over this district during the month. Frost or freezing warnings were issued for interior portions of the district on the 3d, 4th, 5th, 6th, 7th, 15th, 16th, 17th, 19th, 21st, and 26th. Livestock warnings on the 27th were issued for snow for Oklahoma and the northern portion of west Texas, and Amarillo, Tex., reported 9.0 inches of snow on the ground on the 28th.

Small-craft warnings were displayed on the Texas coast on the 1st, 2d, 26th, 27th, and 28th, and northeast storm warnings for the Galveston section on the 28th, all of which were justified. No storm occurred without warning.—I. M. Cline.

DENVER FORECAST DISTRICT.

During the greater part of the month, areas of high pressure occupied the middle portion of the Rocky Mountain region, with frequent Lows of considerable intensity passing across western Canada and the upper Missouri Valley and occasional disturbances moving eastward along the southwestern border. A storm of marked intensity that appeared over southern California on the 9th moved rapidly northeastward during the 10th and 11th and was attended by general precipitation in all portions of the district except eastern Colorado, with occasional excessive downpours in Arizona on the 10th.

A moderate cold wave, without warning, occurred in southeastern and extreme eastern Colorado on the 26th, due to the passage of an area of relatively high pressure across that portion of the State. Local cold waves, also without warning, occurred at Pueblo on the 21st and 28th.

Frost warnings were issued as follows: 2d, southern New Mexico and southeastern Arizona; 3d, southern New Mexico, heavy to killing northwestern Utah; 4th, heavy northern Utah; 5th and 6th, south-central and

southeastern New Mexico, heavy northern Utah; 7th, south-central New Mexico; 19th, south-central and south-eastern New Mexico; 26th and 27th, south-central and southeast Arizona; 28th, south-central Arizona, freezing temperature southeast Arizona.

The warnings were generally verified by the actual occurrence of frost or temperatures at which frost might be expected.—*J. M. Sherier.*

SAN FRANCISCO FORECAST DISTRICT.

November, 1923, was a comparatively quiet month from a weather standpoint on the Pacific coast. The storm movement, like that of the preceding month, was well to the north and the precipitation light and mostly confined to western Washington. The only important feature was the storm of the 28th–30th. This was a small depression which moved southward over the inter-mountain region to southern Nevada and thence south-westward, passing off the southern California coast in the vicinity of San Diego. It caused a strong northeast gale along the central California coast on the night of the 30th, which did considerable damage along the San Francisco waterfront and was without warnings.

No frost warnings were issued and no damaging frosts occurred.

Southeast storm warnings were ordered at Washington and Oregon stations and later extended southward to Mendocino on the California coast. No verifying velocities were reported at coast stations. The warnings are believed to have been justified as strong gales were reported by vessels a few hundred miles off the coast.

Southeast warnings were again ordered at Washington and Oregon stations on the 22d, and continued on the 23d, and verifying velocities occurred at most stations.—*G. H. Wilson.*

RIVERS AND FLOODS.

By H. C. FRANKENFIELD, Meteorologist.

No high waters occurred during the month. There were moderate local floods in the upper Trinity and lower Colorado Rivers of Texas, the former on the 5th and the latter between the 14th and 18th. Warnings for the rises were issued and no damage was done as there had been ample time to remove livestock from the lowlands. Flood stages were not quite reached, except in the Trinity River at Dallas, Tex., where the crest stage on November 18 was 1.5 feet above the flood stage of 25 feet.

Unusually low water prevailed in the Mississippi River north of Lake Pepin, and at St. Paul, Minn., on November 12 the stage was 1.3 feet below zero, or 0.3 foot lower than the previous low record of December 7, 1912. At Fort Ripley, Minn., the low-water record of 2.8 feet on October 20, 1918, was again reached on November 29.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
WEST GULF DRAINAGE.					
Trinity: Dallas, Tex.	Feet. 25	17	18	Feet. 26.5	18

MEAN LAKE LEVELS DURING NOVEMBER, 1923.

By UNITED STATES LAKE SURVEY.

[Detroit, Mich., December 6, 1923.]

The following data are reported in the "Notice to Mariners" of the above date:

Data.	Lakes. ¹			
	Superior.	Michigan and Huron.	Erie.	Ontario.
Mean level during November, 1923:				
Above mean sea level at New York.....	Feet. 602.03	Feet. 579.06	Feet. 571.02	Feet. 244.34
Above or below—				
Mean stage of October, 1923.....	—0.03	—0.32	—0.23	—0.31
Mean stage of November, 1922.....	—0.23	—0.52	—0.40	—0.81
Average stage for November, last 10 years.....	—0.55	—1.21	—0.91	—1.25
Highest recorded November stage.....	—1.48	—3.86	—2.65	—3.48
Lowest recorded November stage.....	+0.53	—0.12	+0.32	+0.93
Average relation of the November level to—				
October level.....		—0.20	—0.20	—0.20
December level.....		+0.20	+0.20	+0.20

¹ Lake St. Clair's level: In November, 573.90 feet.

EFFECT OF WEATHER ON CROPS AND FARMING OPERATIONS, NOVEMBER, 1923.

By J. B. KINCER, Meteorologist.

The generally mild, pleasant weather, with light to moderate rainfall in most sections of the country during November gave favorable weather for seasonal farming operations and for growing crops. At the beginning of the month killing frost had not occurred in the Middle Atlantic Coast States south of New York nor in the Gulf States, but by the 10th it had overspread practically the whole of South Carolina and Georgia and also the northern portions of Alabama and Mississippi. The next killing frost in the South occurred about the 30th and overspread Arkansas and the northern portions of the west Gulf States. At the close of the month the southern portions of the Central and west Gulf States had not experienced killing frost. Frost did some damage to tender vegetation in South Carolina, Alabama, northern Florida, and parts of California, while some minor crops were harmed in southern New Mexico at the close of the month, but in general no material damage resulted from cold weather.

Winter wheat did well in nearly all sections of the country and at the close of the month this crop was reported quite generally as in good condition to enter the winter. Seeding in the extreme southern Great Plains was further interrupted by too much rain during the early part of the month, but after the first week better conditions prevailed and much wheat was sown. Rainfall during the first half favorably affected winter wheat in the middle Atlantic area, while the increased moisture the latter part of the month in the east Gulf States, where drought had prevailed, was very beneficial to winter cereals.

Wet weather in the southern Plains during the first part of November was unfavorable for husking and cribbing corn, with considerable complaint in Oklahoma of grain molding and rotting in the fields. Husking made rather slow progress in Iowa also, due to the snow near the close of October and the high moisture content of the grain. During the week ending November 13, and thereafter, however, much better drying weather prevailed in both the Great Plains and upper Mississippi